

A NEW TORTRICID OF *NERINE* PLANTS ORIGINATING FROM SOUTHERN AFRICA (LEPIDOPTERA, TORTRICIDAE)

by

A. DIAKONOFF

Rijksmuseum van Natuurlijke Historie, Leiden, Netherlands

S. A. ULENBERG

Plantenziektenkundige Dienst, Wageningen, Netherlands

and

L. VÁRI

Transvaal Museum, Pretoria, Republic of South Africa

ABSTRACT

A description is presented of *Phlebozemia sandrinae* Diakonoff, gen. et sp. nov. (Tortricidae, Archipini), a tortricid introduced with plant material from Southern Africa, having caused injury to bulbs, leaves and flowers of *Nerine bowdenii*, a garden flower, grown in glasshouses in the Netherlands. Bionomics, especially host plant acceptance, were studied at the Plantenziektenkundige Dienst, Wageningen, by providing various plant species of Amaryllidaceae to the insects for oviposition. It was shown that the species is not monophagous. The reared material of the insect was compared with authentic Southern African material at the Transvaal Museum, Pretoria, South Africa, and the species proved to occur in that country.

INTRODUCTION

Severe damage was caused to *Nerine bowdenii* Watson, grown in a nursery's glasshouse in the Netherlands in September, 1983. The damage consisted of excavated bulbs and escapes and partly injured flowers (figs. 19—21).

A sample of the affected material was sent to the second author for identification of the insect. The rest of the plants was destroyed and adequate control measures were taken in the glasshouse. The damage appeared to be caused by an unknown tortricid.

Nerine belongs to the plant family Amaryllidaceae and is endemic in South Africa. Since the XVIIth century, *Nerine* is a popular garden flower in Europe, with *Nerine sarniensis* (L.) Herbert, the Guernsey Lily, as the most popular species in England, and for years exclusively cultivated in Guernsey. In other countries of Europe a large number of varieties have been developed from several other *Nerine* species, especially from *Nerine bowdenii* Watson. This species became highly valued in gardens for

their showy, late-autumn flowers and as nursery stock for the production of cut flowers (Van Brenk, 1980).

BIONOMICS

In order to obtain material for taxonomic study and get information on the developmental cycle, the host plant acceptance, and the feeding habits, rearing experiments of the tortricid were carried out by the second author. Three generations were reared indoors on *Nerine bowdenii* at a temperature of 18 °C. These cultures provided the following observations. The moths oviposited upon leaves and flower buds. The larvae started as miners. The later instar larvae bored into bulbs and scapes or fed on leaves which were partly folded lengthwise by webbing, in a way characteristic for Tortricidae.

The following lengths of the different development stages were recorded: egg 10—13 days, larva 19 days, pupa 23 days. The longevity of the individual moths has not been recorded; on average the flying period of the different gener-

ations was three to four weeks.

To determine host plant acceptance, two tests were carried out.

In the first test, *Narcissus cyclamineus* de Candolle ex Redouté was presented as food plant to first instar larvae of the third generation, reared on *Nerine bowdenii*. The larvae accepted *Narcissus* as food plant, developed fully on it, pupated and hatched.

In the second test ovipositing female moths were given the choice between *Nerine bowdenii* and several other Amaryllidaceae, viz., *Crinum powellii* Henderson, *Hippeastrum* Herbert, *Hymenocallis* (×) cv. "Festalis" Hort.¹⁾ and *Sprekelia formosissima* (L.) Herbert. Eggs were deposited on all five plant species. Larvae developed on *Hippeastrum*, *Hymenocallis* and *Sprekelia*, but not on *Crinum*.

Unfortunately, most egg masses of the fourth generation on *Nerine bowdenii* dried out. Simultaneously, the first instar larvae on *Hippeastrum*, *Hymenocallis* and *Sprekelia* died, probably because of extreme temperatures, caused by an error with the heating system in the glasshouse where the tests were carried out. By this abrupt ending of the tests we are not able to say anything about the suitability of the three last mentioned Amaryllidaceae as food plants for this tortricid. However, by the host acceptance, shown by the oviposition behaviour, the full development of the larvae on *Narcissus* and the initial development of the first instar larvae on *Hippeastrum*, *Hymenocallis* and *Sprekelia*, it is suggested that the tortricid in question is polyphagous.

THE INSECT

A preliminary study by the first author of the bred material of the insect revealed that the surmise of its origin must be correct, for it could at once be identified as a member of the large *Epichoristodes* Diakonoff group of the Archipini (a tribe of the subfamily Tortricinae), that is endemic to the Afrotropical Region and Madagascar, a group widely distributed by several, rather uniform, closely interrelated and often extensive genera (Diakonoff, 1960). The present species, however, proved to belong to an apparently undescribed distinct genus and species.

In order to corroborate this preliminary identification, the third author of this paper undertook the comparison of our material with the

authentic Southern African material in the Transvaal Museum at Pretoria. Judging from external characters, it appeared that the present species resembled "*Epichorista*" *geraeas* Meyrick closely, but internally differed entirely by the genital characters and especially the wing venuration, an important criterion, as will be explained in the description below. Besides, he was fortunate to find in the Transvaal Museum collection several male and female specimens of a quite similarly looking, but unnamed species, that showed to be identical with our material of the *Nerine* pest, proving indeed that it is a native of Southern Africa. After having received this information, the first author could proceed with the description of the new genus and species.

Phlebozemia Diakonoff gen. nov.

(φλέψ = vein, ζημύ = loss)

Male. — Head with appressed scales, a dense pointed tuft on face. Ocellus small, posterior. Haustellum short, in rest concealed between palpi. Antenna moderately thickened in male, ciliations 1. Palpus rather long, moderately sinuate, oblong-triangular, closely appressed to face and frontal tuft, with short, appressed scales, terminal segment short, subobtusely. Thorax without a crest. Abdomen long. Posterior tibia simple, smooth.

Fore wing rather long, narrow, oblong-sublanceolate, costa broadly curved along anterior half, slightly sinuate, actually concave posteriorly, apex pointed, termen gently sinuate, strongly oblique. Vein 1b furcate at base, thence running halfway between cell and dorsum, 2 from middle of lower edge of cell, 3 from angle, 4 absent, 5 and 6 parallel and equidistant, 7 free, to termen below apex or to apex, 8 moderately approximated at base or short-stalked, 11 from slightly before middle of cell, chorda absent.

Hind wing trapezoidal, 1¼, rather pointed, without a cubital pecten. Veins A1—A3 all distinct, 2 from ⅓ of cell, 3 from angle, 4 absent, 5 slightly approximated at base, 6 and 7 stalked.

Female. — Haustellum apparently longer, not altogether concealed. Antenna simple. Palpus longer, less pointed. Wings slightly broader. Abdomen similarly long. Otherwise as male.

Male genitalia. Of the usual and characteristic type of Afrotropical Archipini, resembling

¹⁾ *Hymenocallis* (×) cv. "Festalis" Hort. (common name *Ismene festalis*) is a hybrid of *Hymenocallis narcissiflora* (von Jacquin) Macbride (×) *Elisena longipetala* Herbert (Anonymous, 1975).

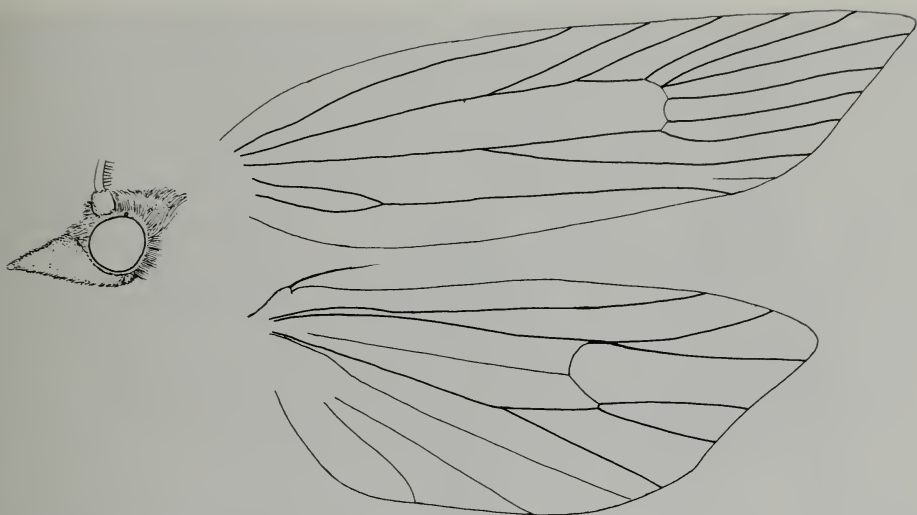


Fig. 1. *Phlebozemia sandrinae* g. & sp. n., sketch of head and wing neurulation.

those of *Epichoristodes* Diakonoff. Tegumen moderate, rather conical. Uncus long, little shorter than tegumen, with narrow base, gradually dilated, top truncate, hardly emarginate. Socius moderate, oblong, narrowed, shorter than arm of tegumen. Gnathos robust, sclerotic, arms with dilated bases, hooks strong, moderately long. Vinculum triangular, sclerotic but slender. Transtilla narrow, straight, dilated laterally. Labis moderate, crown-shaped, spiny, little sclerotic. Valva small, hyaline, with an unusually robust and darkly sclerotic basal edge, swollen, constricted below middle; pulvinus proper hyaline, small, with short hairs; sacculus sclerotic, dilated and rounded-prominent in middle; inner rim darkly sclerotic. Aedeagus gradually curved, flattened dorso-ventrally at top; cornutus one, a straight and long, slender spine.

Female genitalia. Lobus analis oblong and slender, triangularly dilated towards top. Ninth segment darkly sclerotic. Apophyses slender and long, postapophyses very long, hyaline, basal furca unusually long. Sterigma transversely oval, moderate, highly sclerotic, with an oval large central orifice, lower rim darkly sclerotic throughout.

Colliculum short, cup-shaped, slight lateral structures above end. Ductus bursae hyaline above, simple throughout, ductus bullae from end of hyaline part, corpus bullae moderate. Corpus bursae simple, without signa.

Type-species: *Phlebozemia sandrinae* spec. nov.

An interesting novel form, externally rather similar to *Epichoristodes* Diakonoff, 1960, but at once recognisable by the absence of vein 4 in both fore and hind wings. The superficially very similar "*Epichorista*" *geraeae* Meyrick differs besides, by shorter labial palpi with especially the terminal segment being shorter, more pointed and drooping; furthermore, by small, almost parietal socii and by an intricate combination of diversely shaped cornuti, while *P. sandrinae* has only one simple cornutus, etc.

The genus belongs to the tribe Archipini and, within it, it may be placed into the large *Epichoristodes* Diakonoff group of genera, with the following synapomorphies.

Valva semioval, submembranous, with radial wrinkles, a sclerotic sacculus, slender or dilated in middle; dorsal edge of valva more or less sclerotic, with labis. Transtilla narrow. Sterigma with a large, transversely-oval ostium and a moderate, sclerotic colliculum.

The genus *Phlebozemia* has the following autapomorphies: The loss of vein 4 in both the fore and hind wing, strongly sclerotic entire basal edge of valva (with a crown-shaped, dentate labis). Strongly sclerotic, in middle well dilated sacculus, and a short, semioval disc of valva. Gradually curved aedeagus. Ductus bursae with a short, cup-shaped colliculum, below this hyaline for a stretch. Absence of signum.

When compared with *Epichoristodes*, especially the neurulation, but also the unusually extended sclerotization of the basal edge of the valva are distinct autapomorphies of the genus

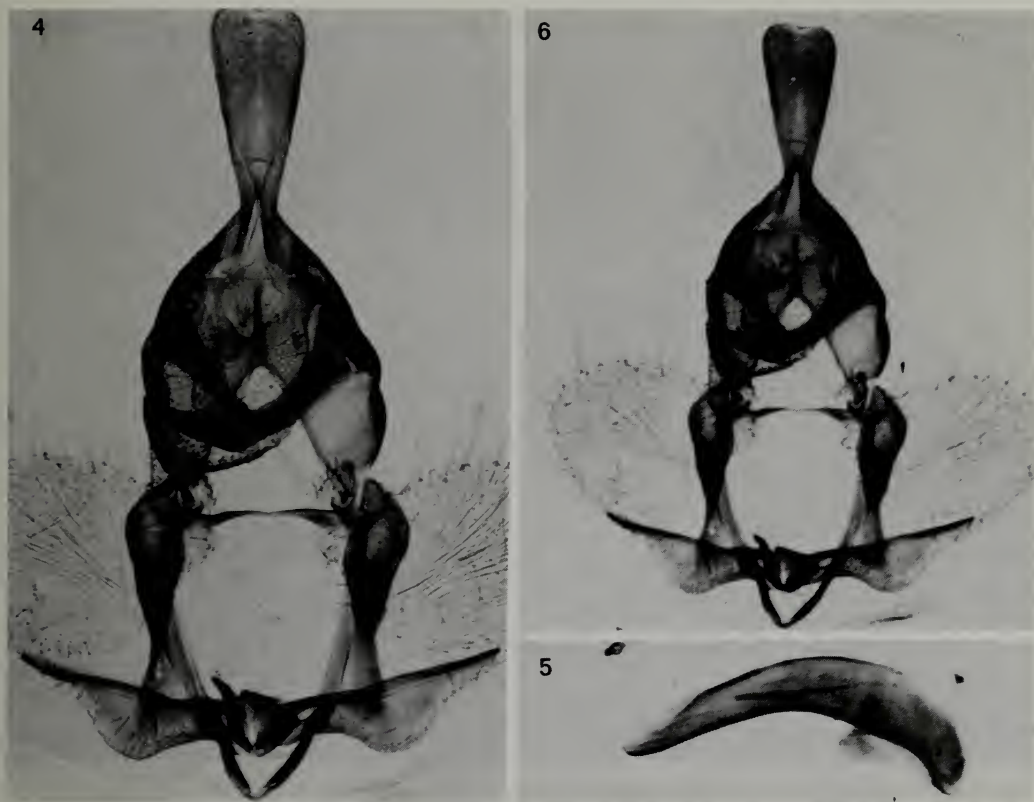
2



3



Figs. 2, 3. *P. sandrinae* g. & sp. n. 2, adult male; 3, adult female.



Figs. 4—6. *P. sandrinae* g. & sp. n. 4, male genitalia; 5, aedeagus; 6, general aspect of the genitalia, less magnified.

Phlebozemia; these two characters support one another as autapomorphies in a conspicuous way. On the other hand, the crown-shaped large labis, that is small and mostly rod-like in *Epichoristodes*, is a less trustworthy character, occurring in diverse stages of development in several groups of genera; it might be a parallelism.

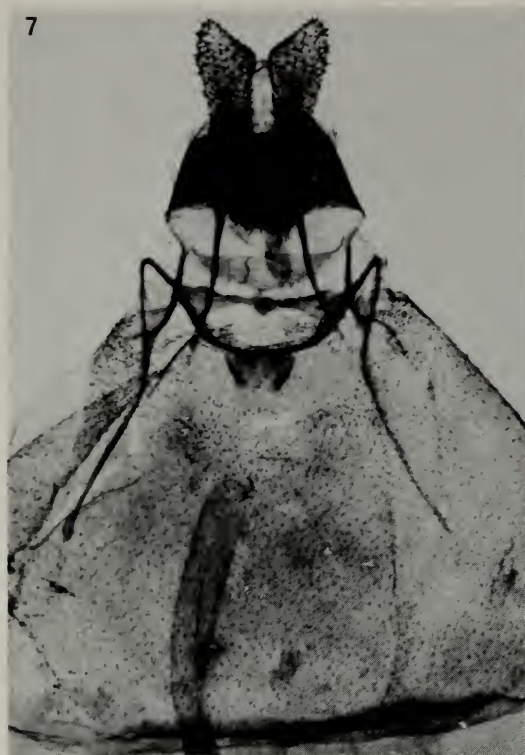
***Phlebozemia sandrinae* spec. nov.**
(figs. 1—18)

Male. — Wing span 18 mm. Head brownish-fuscos, antenna fuscous, scape dark brown. Palpus grey-fuscous with lower half throughout white, tinged cinereous, with well-defined edge, terminal segment pale ochreous with fuscous base. Thorax ochreous touched with olive or grey, anteriorly suffused with brown, tegula with basal half brown. Abdomen glossy cinereous.

Fore wing rather long and narrow, costa broadly curved along basal half, almost straight

posteriorly, apex subacute, appearing rather pointed, termen rather sinuate, strongly oblique. Light ochreous, with a strong silky gloss, unicolorous except for narrow streaks of dark brown dusting along upper and lower edges of cell, along all terminal veins, along vein 2 only from end of cell to wing margin and, hardly visible, along vein 1b; a faint blackish point on base of vein 5. Cilia glossy pale ochreous. Hind wing rather glossy anthracite-blackish, paler towards dorsum, darker towards apex. Cilia pale ochreous, grey along anterior half of termen and along dorsum, throughout with a blackish-grey narrow basal band.

Female. — Wing span 20 mm. Palpus rather dusted with dark grey, base white. Head and thorax darker, bronze-tinged. Darker bronzetawny, densely dusted with blackish-brown along upper half of wing as far as lower edge of cell, and narrowly along terminal veins; additional darkish dusting over dorsal third of wing; a darker brown vertical mark along lower half



Figs. 7, 8. *P. sandrinae* g. & sp. n. 7, female genitalia, ovipositor and sterigma; 8, bursa copulatrix.

of discoidal vein. Cilia glossy pale ochreous, in tornus and along dorsum glossy cinereous.

Hind wing light anthracite-grey with a silky gloss and narrowly black veins; apical third of wing tinged darker fuscous. Cilia sordid pale ochreous, with a narrow pale grey basal band.

Reared from larvae in bulbs, stalks and leaves of *Nerine bowdenii* Watson, Wageningen, 15—20.xii.1983 (Plantenziektenkundige Dienst, S. A. Ulenberg), ♂ holotype, genit. slide 10640, ♀ allotype genit. slide 10641, 14 ♂, 6 ♀, paratypes (with 2 larvae and 8 pupae).

Southern Africa, Natal, Rietvlei, 1918 (leg. Otto), genit. slide 4584, 1 ♂. Transvaal, Pretoria, 11.ii.'10 (A. J. T. Janse), genit. slide 4677. Pretoria North, 20.iii.1917 (C. J. Swierstra), genit. slide 10716, 1 ♂. Natal, Karkloof, 22.i.1917 (A. J. T. Janse), 1 ♂. All paratypes, in the Transvaal Museum, with hind wings paler, brownish instead of greyish, but otherwise quite similar.

The holo- and allotype with several paratypes will be deposited at the RMNH, Leiden; other paratypes 7 ♂, 3 ♀ (with 2 larvae and 8 pupae),

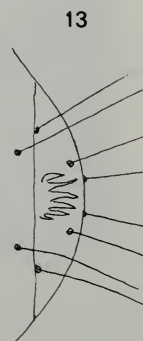
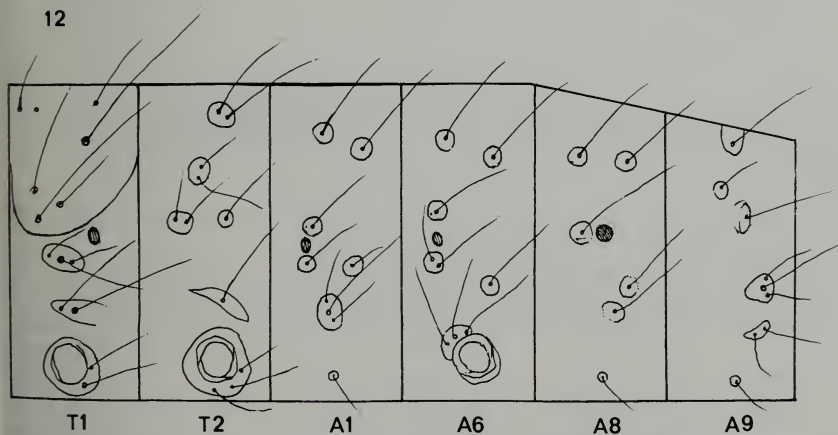
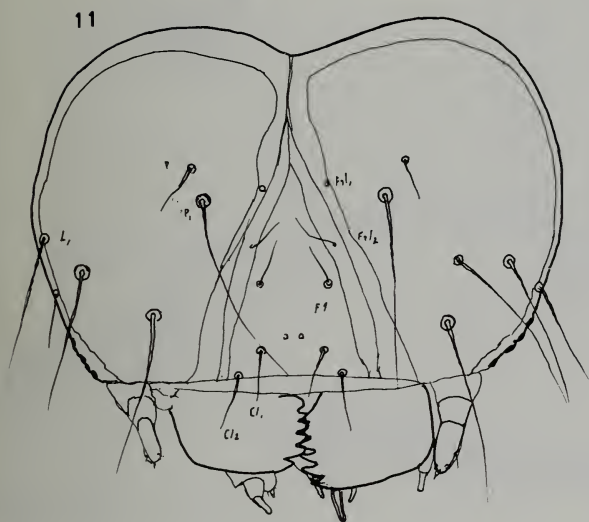
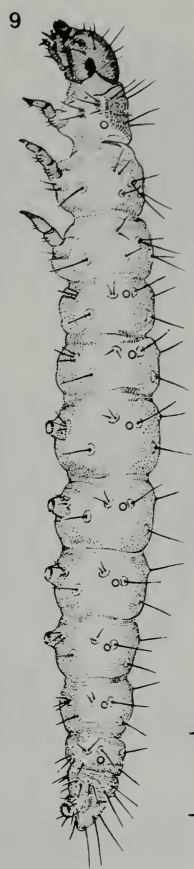
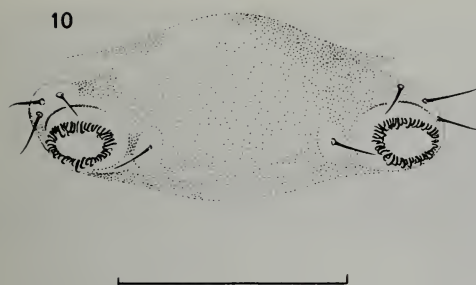
in the collection of the Plantenziektenkundige Dienst at Wageningen, and 5 ♂, 2 ♀ in the Transvaal Museum, Pretoria.

The following material of "*Epichorista*" *geraeas* Meyrick, from the Transvaal Museum, has been compared: holotype: /40 51/Pretoria 2.10.'07 A. J. T. Janse/G 10759/*Epichorista geraeas* M type no. 1051/(male). — Pretoria 15.11.'11 A. J. T. Janse/G 10760/*Epichorista geraeas* M./♂. — Pretoria, 15.x.'17, A. J. T. Janse, 1 ♂.

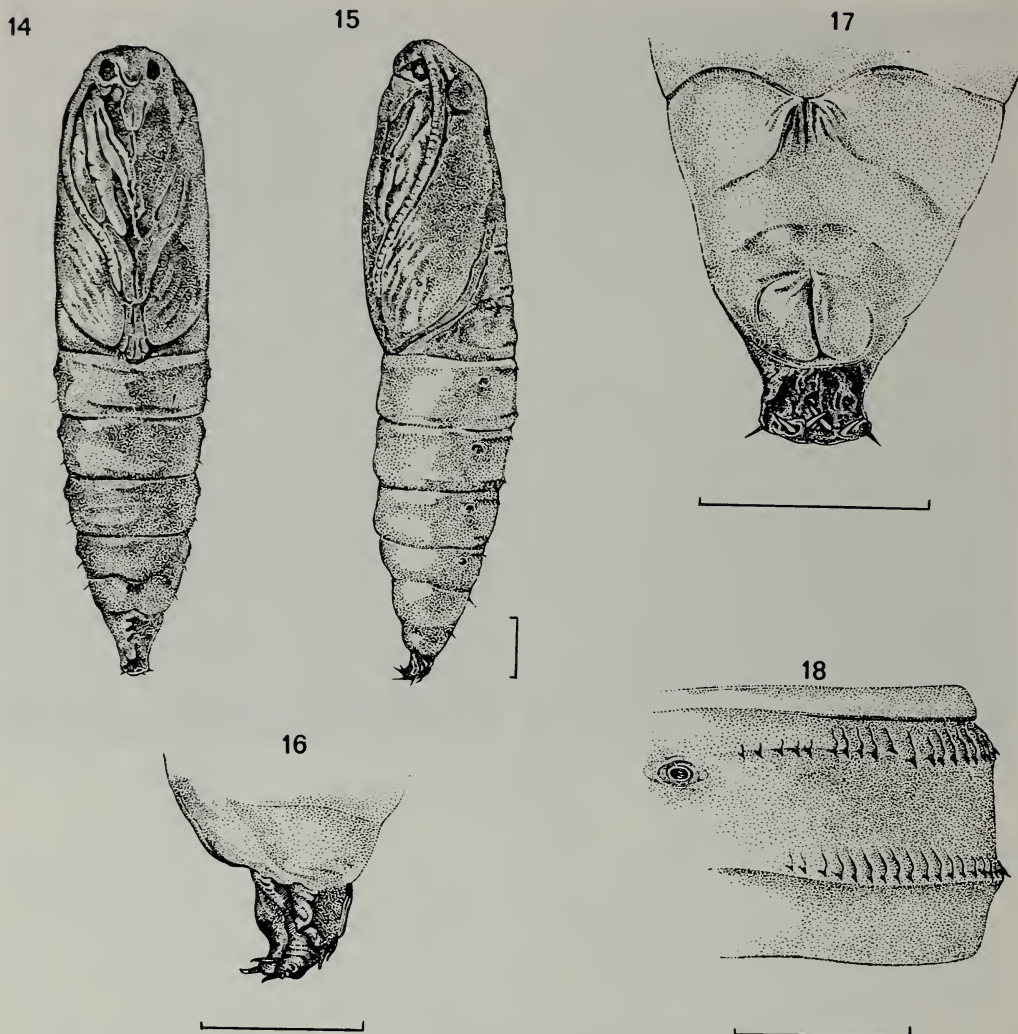
Larva (figs. 9—13)

Length 13 mm. Head hypognathous. Stemmata developed. Adfrontals not reaching vertex. Spinneret robust, thick-walled. Frontal seta one, rather shifted mesad. Fronto-lateral (adfrontal) setae two. Clypeal setae two: Cl₁ shifted mesad and dorsad, Cl₂ marginal. Anterior seta one, minute. Lateral seta L₁ distinct. Posterior setae two, P₂ small, approximated, dorsad and slightly laterad of P₁. Vertical setae not traceable.

Body elongate, integument finely spinulose,



Figs. 9—13. *P. sandrinae* g. & sp. n., larva. 9, lateral aspect; 10, third abdominal segment, ventral aspect; 11, chaetogram of head; 12, chaetogram of body; 13, the same of anal segment (measure, fig. 9: 1 mm, fig. 10: 0.5 mm).

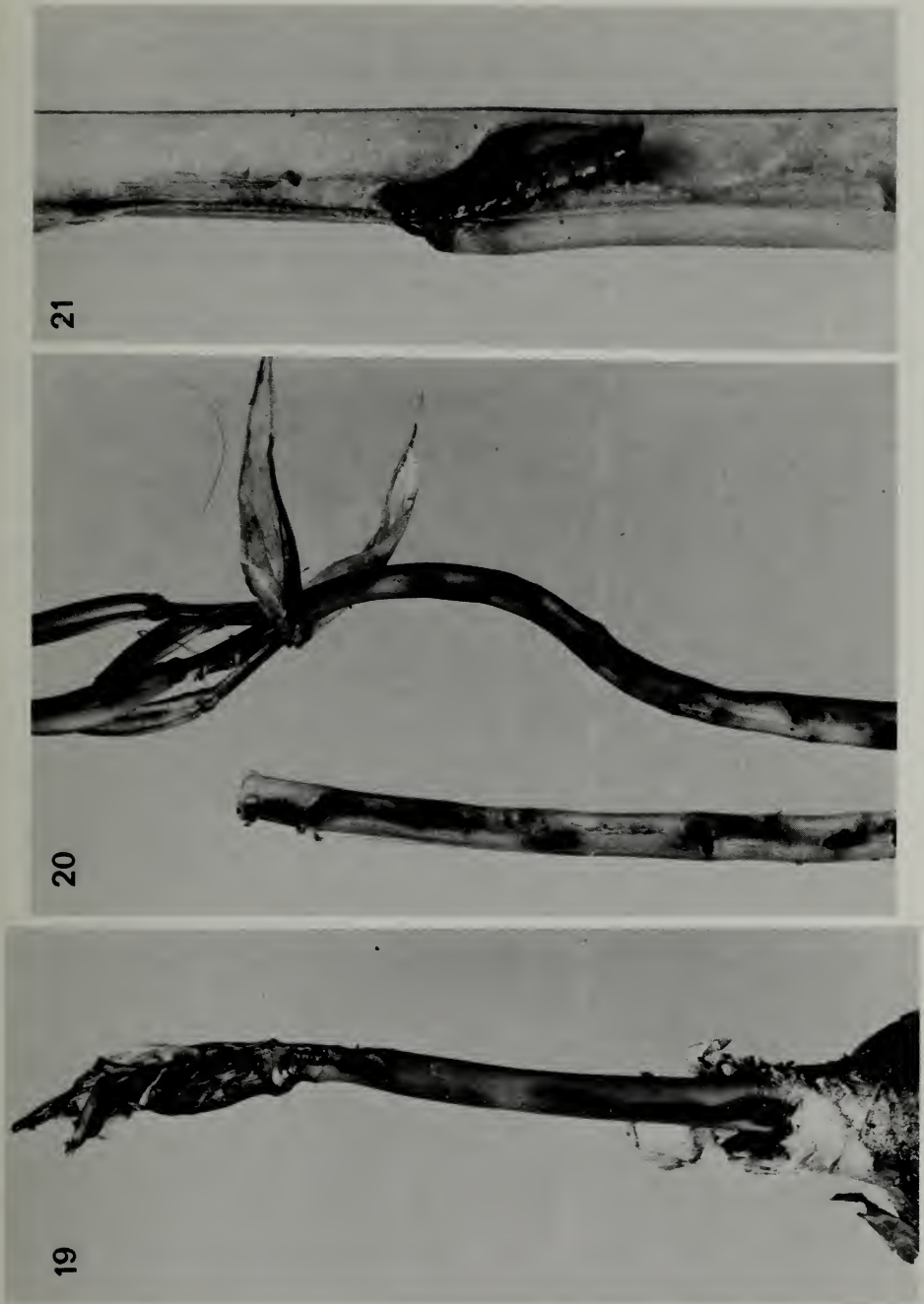


Figs. 14—18. *P. sandrinae* g. & sp. n., pupa. 14, ventral aspect; 15, lateral aspect; 16, cremaster, strongly magnified, ventro-lateral aspect; 17, end of female abdomen and cremaster, strongly magnified, ventral aspect; 18, abdominal tergite in lateral aspect, with bands of crochets (measure = 1 mm).

secondary setae not perceptible. Spiracula rounded-oval, that of prothorax larger, that of segment 8 enlarged, circular, of segment 9 absent. Setal pinnacula large, mostly round and well-defined. Prothorax with prespiracular L group of setae trisetose, on one pinnaculum, L_3 larger than others, L_1 proterodorsal of 2; SV_1 and SV_2 on one pinnaculum, D_1 proterodorso-rostral of D_2 , SD_1 and SD_2 on one pinnaculum; L_1 and L_2 on one pinnaculum, arranged almost

horizontally, L_3 on separate pinnaculum, SV group 2- or 3-setose.

Abdominal segments with right and left D_1 closer together than D_2 , except on segments 6—8. SV_1 hardly postspiracular on segment 1, exactly above spiraculum on segment 2, on segments 3—7 slightly prospiracular, on 8 entirely before spiraculum. SV_2 very small on segments 4—8, on others not traceable; segment 10 with four pairs of setae on dark warts, arranged as in fig.



Figs. 19—21. Injury of *Nerine bowdenii* plants by *Phlebozemia sandrinae*. 19, a bulb with damaged shoot; 20, damaged stalks; 21, split stem, showing boring gallery with a mature pupa, partly protruding for the emergence of the moth. (Phot. of Laboratorium voor Bloembollenonderzoek, Lisse.)

13. Anal fork present. Prolegs normally developed, crochets 43—48, uniserial, long and short alternating, on abdominal pseudopods (fig. 10); half a circle of the same kind of alternating crochets on the anal pseudopods.

Pupa
(figs. 14—18)

Length 10 mm. Dark brown. Haustellum short and thick, not reaching to middle of antennae. Labial palpi short. Antenna to just beyond midway between tips of mid- and hind legs, about 5/6 of length of fore wings. Hind legs just beyond fore wing tips. Abdominal segments with a double row of longitudinal ribs, each ending posteriorly in a short spine: a submarginal row of longer ribs and a postmedian row of slightly shorter ribs (fig. 18). Cremaster strongly sclerotic, thick, bent and concave ventrally, with six strong terminal spikes, lateral largest and projecting (figs. 16, 17).

ACKNOWLEDGEMENTS

We like to thank Mr. A. van Frankenhuyzen, Plantenziektenkundige Dienst, Wageningen, for performing the rearing tests, Mr. P. Muller, Laboratorium voor Bloembollenonderzoek, Lisse and G. van Brenk, Vakgroep Tuinbouwplantenteelt, Landbouwhogeschool, Wageningen, for providing the plant material for these experiments. Mr. A. S. J. Noordijk, Plantenziektenkundige Dienst, Wageningen, made most drawings.

REFERENCES

- Anonymous, 1975. Classified list and international register of Hyacinths and other bulbous and tuberous-rooted plants. — Koninklijke Algemene Vereniging voor Bloembollenonderzoek, Hillegom, Holland: 1—277.
- Brenk, G. van, 1980. Historie, groei en bloei van *Nerine bowdenii* (1). — Vakblad voor de Bloemisterij 21: 38—41.
- Diakonoff, A., 1960. Tortricidae from Madagascar (1). — Verh. K. ned. Akad. Wet., Nat. (2) 53 (1): 1—209, figs. 1—90, pls 1—40.